EASA
European Aviation Safety Agency

Portable electronic devices

2nd EASA Workshop on Cabin Crew & Cabin/Passenger Safety

14 April 2015, Cologne

Your safety is our mission.

An agency of the European Union

Agenda

- Expanded use of PEDs on board
- PEDs electromagnetic interference risks
- Use of PEDs in crew bunk areas
- PEDs as Dangerous Goods

Expanded use of PEDs on board

Jan Boettcher

Air Operations Regulations Officer, Flight Standards

Overview

Presentation is focussed on CAT operations

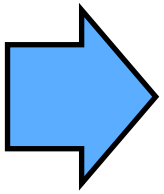
- New general approach
- Categories of PEDs
- New Acceptable Means of Compliance (AMC)

Part-CAT – Implementing Rule (IR)

CAT.GEN.MPA.140

The operator shall not permit any person to use a portable electronic device (PED) on board an aircraft that could adversely affect the performance of the aircraft's systems and equipment, and shall take all reasonable measures to prevent such use.

No change to the IR, but to AMC and GM



Decision 2014/029/R (Part-CAT)

New general approach

To permit the use of all PEDs during all phases of flight

1. The operator has to demonstrate that PEDs have no negative impact on the safe operation

2. Following 1., the operator decides which PED may be used during which phases of flight

Categories of PEDs

GM1 CAT.GEN.MPA.140

- Non-intentional transmitters
  - Audio and video players, electronic games, etc.
  - Can non-intentionally radiate transmissions
- Intentional transmitters (T-PEDs)
  - Mobile phones, smartphones, computers with mobile phone connection or WLAN, etc.
  - Radiate transmissions as part of their intended function

Acceptable Means of Compliance on PEDs

- **AMC1 CAT.GEN.MPA.140**
  - Technical prerequisites for the use of PEDs
- **AMC2 CAT.GEN.MPA.140**
  - **Procedures for the use of PEDs**

To distinguish between:

- ***Passenger compartment***
- *Flight crew compartment*
- *Areas not accessible during flight*

AMC1 CAT.GEN.MPA.140 - 8 scenarios

No.	Technical condition	Non-intentional transmitters	T-PEDs
1	Certified as T-PED tolerant	All phases	All phases
2	Complete electromagnetic interference (EMI) assessment	All phases	All phases
3	Certified as T-PED tolerant for particular technologies (e.g. WLAN)	All phases	All phases, restricted to particular technologies
…	…	…	…
7	No assessment	All phases - except low visibility approach	Not permitted
8	In any case	a) before taxi-out b) during taxi-in after end of landing roll c) during delayed departure	

AMC2 CAT.GEN.MPA.140

Use in passenger compartment 1

- Procedures and training
  - Procedures in place to control use of PEDs, including
    - Passenger briefing
    - Passenger handling
    - Stowage of PEDs
  - Crew members and ground personnel should be trained to enforce possible restrictions

AMC2 CAT.GEN.MPA.140

Use in passenger compartment 2

- Stowage: The operator
  - Identifies when PEDs are to be stowed
  - Determines suitable stowage locations, taking into account the size and weight of PEDs
- Passenger information: The operator provides information
  - Which PEDs can be used when
  - When and where PEDs are to be stowed
  - That instructions of the crew are to be followed
- Passenger briefing
  - According to the rules (CAT.OP.MPA.170)
  - Remind passengers to pay attention and to avoid distraction

Main features

- PEDs can only be used when it is safe
- Operator decides on the effort, depending on the airframe
- Note: In Europe the operator may permit mobile phone calls during flight (within the applicable telecommunication regulations)

PEDs electromagnetic interference risks

Friedhelm Runge

Chief Expert Avionics and Electrical Systems, Certification Directorate

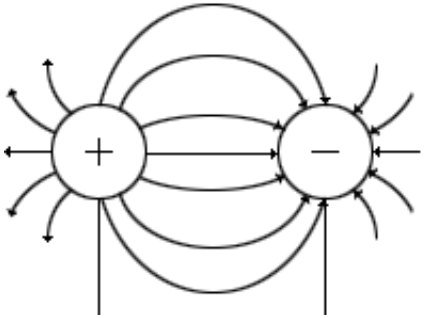
Overview

Presentation is focussed to explain ElectroMagnetic Interference (EMI)

- Electrical Field
- Magnetic Field
- Electromagnetic Radiation
- Interference Examples

Electrical Field

- The Electrical Field is a measure for the force applied to separated electric charges to move to each other with the aim to neutralise. Unit is Volt/meter
- Example:
  - hair stands on end on cold dry day
  - Spark when touching metal on cold dry day
  - A spark jumping from one needle to another when increasing the voltage



- Force between electrical charges
  - Increasing by Voltage
  - Decreasing with distance

Magnetic Field

- Each electrical current is creating a magnetic field.
- Magnetic fields create forces
- Magnetic fields are change resistive – In case of changes to the magnetic field electrons are moved in conductors to create a current they crate a magnetic filed which is working against the change.
- Use cases:
  - Transformer,
  - Electrical motor, generator
  - Electrical magnet, doorbell
  - Spark coil

Electromagnetic Radiation

- Periodic movement of electrons in conductors are creating electromagnetic fields. (Dynamic coexistence of a magnetic and electrical field.)
- Electromagnetic fields are traveling as wave through vacuum or other media until received by another conductor in which they are moving electrons again.
- Transmissions are performed on a straight line in all directions.
- Wave is traveling with the speed of light.
- Number of periodic repetitions per second is the frequency of the wave.
- As we know the speed and repetition per second one can calculate the wave length λ. => optimum antenna geometry
- Intensity is reducing by distance from transmitter

Spectrum (Frequency) use

Frequency (Hz)	Wave length (m)	Use
< 30 kHz	>10 km	Alternate current, audio
30 kHz – 3 MHz	10 km – 100 m	Clock time signals, long-wave, medium-wave broadcast (NDB, ADF), amateur radio
3 MHz – 30 MHz	100 m - 10 m	HF (short wave) radio
30 MHz – 300 MHz	10 m – 1 m	VHF (Marker, GS, LOC, VOR, VHF) FM broadcast
300 MHz – 3 GHz	1 m – 10 cm	UHF (ELT, DME, Transponder, GPS) TV, mobile phone, WLAN, Bluetooth, microwave oven
3 GHz – 30 GHz	10 cm – 1 cm	Weather Radar
	… µm	Light

- Transmitters have specifically allocated frequency bands to avoid interference

Non intentional transmissions

Can happen on all frequencies and emitted by any electronic device

- Transmitters may radiate on other frequencies as well
- Receivers may have intermediate frequencies
- Clocks are used in digital systems
- Displays are refreshed in a cyclic way
- Units may have sparks or changing magnetic fields
- Transmissions may be demodulated and create voltage/current disturbing sensors

Non intentional transmissions are limited by regulation

Effects of Non Intentional Transmissions

Received by aircraft receivers instead/on top of expected low level signals => function disturbed

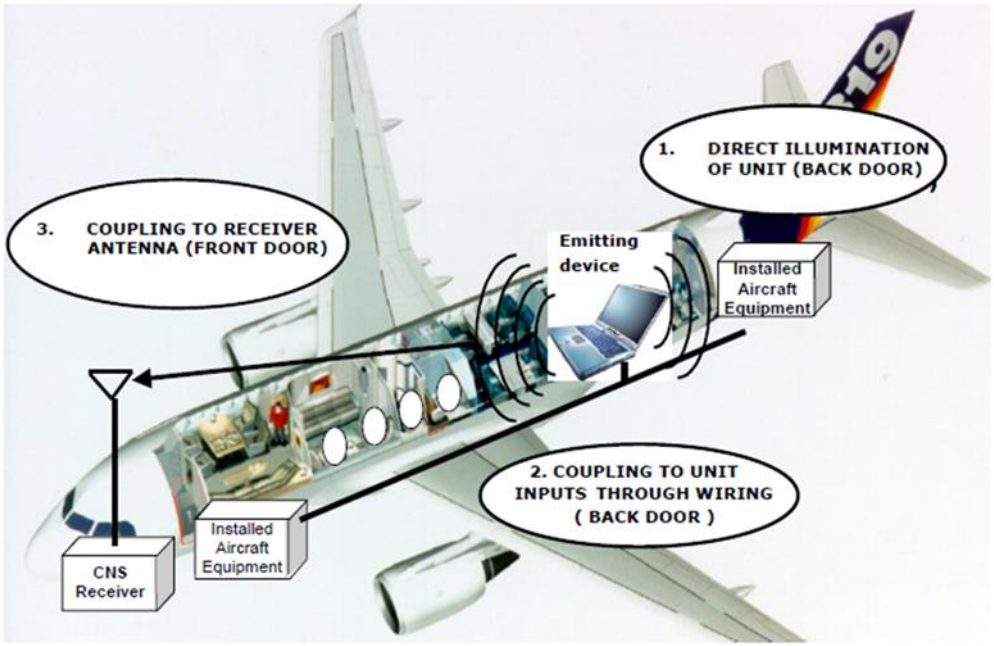


Figure taken from DO-294C

Figure 5-2 Depiction of Front-door and Back-door Coupling

Signal is traveling through windows, doors from inside the cabin to the system antennas mounted outside the aircraft

Effects of Intentional Transmissions

- Transmitters can create quite high electromagnetic fields in close distance.
- Can create artificial signals in the avionics which result in potential (temporary / permanent) malfunctions.
- A certain shielding and certification testing is performed to protect critical aircraft systems against external transmissions (radio stations) since introduction of integrated display systems in the 90s.
- PED compatibility is addressed on new certified aircraft models otherwise further mitigation is needed.

Examples of Disturbances

- Voice communication disturbed (ATC, PA)
- Navigation systems disturbed (shivering indicators, failure indications, wrong indications, loss of function)
- False fire alarms (lavatory, cargo bay)
- ? Difficult to trace back and reproduce

Dependent on type and location of the PED as well as on the aircraft model and configuration.

Summary EMI

- All electronic devices including the aircraft creating non-intentional radiations.
  - When exactly at aircraft system frequency and reaching aircraft antenna at sufficient level that system may be disturbed but failure can be detected unless in low visibility approach.
- Transmitters may create high electromagnetic field in close vicinity.
  - Aircraft with electronic display systems are certified that High Intensive Radiated Fields (e.g. from radio stations) are not harming critical systems.

Use of PEDs in crew bunks

Sabine Meissner

Cabin Safety Expert, Certification

Use of PEDs in crew bunks

Crew Rest Compartments are very often a special form of isolated compartments!

Isolated compartments are remote areas or even enclosed rooms like bed rooms or conference rooms on governmental or business Jets.

Problem: There is not guarantee for occupancy during the whole flight.

Who will report an eventual fire?

Use of PEDs in crew bunks

Regulation: Isolated compartments and crew rest compartments must be equipped with smoke detectors. Performance must be demonstrated via test.

Observations since "Generation Online" came up: first interference of T-PEDs with smoke detectors in lavatories are reported. Dependencies on distance between T-PED and model of the smoke detector. It comes to false alerts!

What does a false alert mean?

Use of PEDs in crew bunks

Lavatories: Easy to find out what is going on

Crew Rest compartment required standard procedure for Lower deck:

- Check that the CRC is empty
- Close up and discharge the Halon
- Divert to closest Airport

This is a lot of effort for a false alert!

What can you do?

Use of PEDs in crew bunks

If you introduce WIFI in your fleet

- make sure all areas are checked be the installer which are occupyable in limited flight phases and equipped with smoke detectors
- Check especially areas where a short distance is kept to the smoke detectors. Many bunks have them strait above the bed!
- Be careful with minor design changes of interior!
- Sometimes smoke detectors are in the ceiling of the crew rest compartment.

PEDs as Dangerous Goods

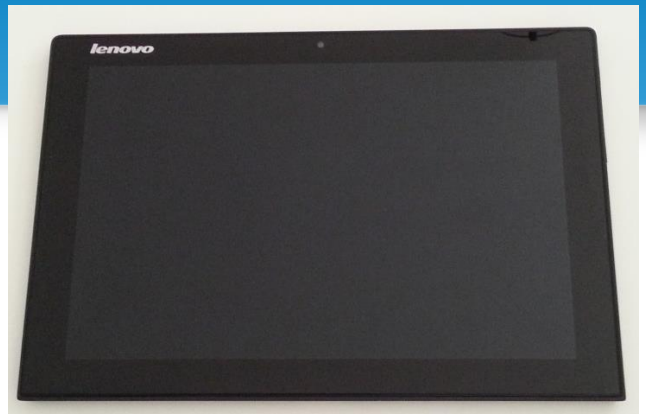
Lia Calleja-Barcena

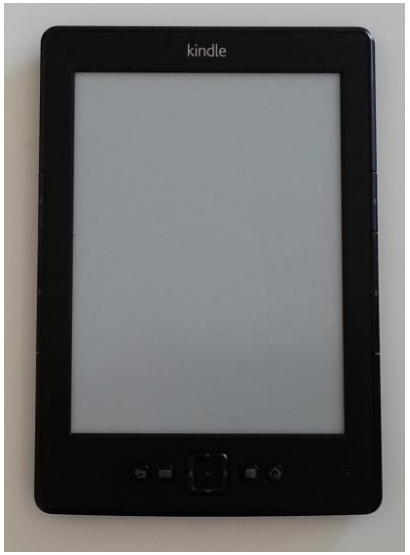
Dangerous Goods Expert, Air Operations, Flight Standards

PEDs with lithium batteries

- Two kind of lithium batteries:
  - Lithium ion batteries (cell phones, tablets, laptops, digital cameras…)
  - Lithium metal batteries
- Lithium batteries can start a fire when mishandled, damaged, defective, improperly packaged, designed or manufactured (**manufacturers admit defects in manufacture**)
- Even **fully compliant batteries easily ignite** if exposed to heat

Examples of PEDs





Power Packs are NOT devices

Average of items on board – some math

- 4-5 items x 104 pax per flight = **416-520 PEDs** containing lit batt on board as average **ONLY ON THE CABIN**
- (Regular laptop battery has 9 to 12 cells)

- 2,307.713 passengers per day in Europe only
- 2006 – 1 every 200.000 batt had manufacture defect leading to thermal runaway
- 1 item per passenger →4.212 possibilities of events per year in Europe

Dangers of lithium batteries: 3 accidents so far.

UPS 2010 and Asiana

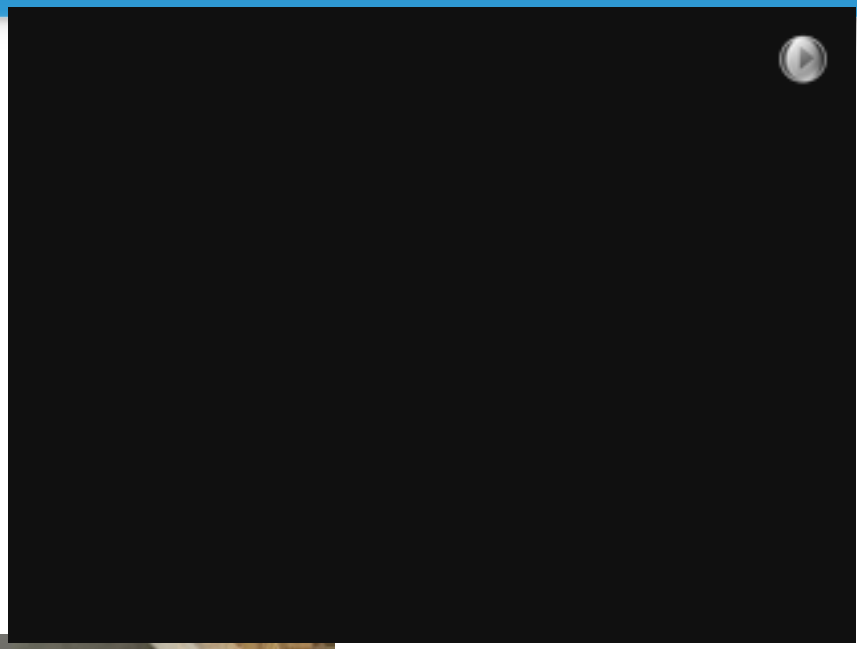
Passenger aircraft – items in the hold

Mail and cargo items

Passenger's baggage

Increasing number of incidents on board

Passenger awareness



Procedures

Training

E-cigarettes – other risks of PEDs

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Q & A

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